

CORRES. CONTROL  
OUTGOING LTR NO.

000044820

OE ORDER# 4700.1

94 RF 10986

## EG&G ROCKY FLATS

DIST.	LTR	ENC
MARAL, M.E.		
URLINGAME, A.H.		
USBY, W.S.	X	X
RANCH, D.B.		
ARNIVAL, G.J.		
AVIS, J.G.		
ERRERA, D.W.		
RAY, R.E.		
EIS, J.A.		
LOVER, W.S.		
OLAN, P.M.		
ANNI, B.J.		
ARMAN, L.K.		
EALY, T.J.		
EDAHL, T.		
ILBIG, J.G.		
UTCHINS, N.M.		
ACKSON, D.T.		
ELL, R.E.		
UESTER, A.W.		
ARX, G.E.		
CDONALD, M.M.		
CKENNA, F.G.		
ONTROSE, J.K.		
ORGAN, R.V.		
OTTER, G.L.		
ZZUTO, V.M.		
ISING, T.L.		
ANDLIN, N.B.		
CHWARTZ, J.K.		
ETLOCK, G.H.		
TEWART, D.L.		
TIGER, S.G.		
DBIN, P.M.		
DORHEIS, G.M.		
ILSON, J.M.		

EG&G ROCKY FLATS, INC.

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October 28, 1994

94-RF-10986

Scott R. Grace  
Environmental Restoration Division  
DOE/RFFO

RESPONSE TO COMMENTS FOR TECHNICAL MEMORANDUM NO. 9, CHEMICALS OF  
CONCERN - WSB-119-94

Action: None required.

Attached are two copies of EG&G Rocky Flats, Inc. formal response to comments for Technical Memorandum No. 9, Chemicals of Concern, submitted by the Environmental Protection Agency and the Colorado Department of Public Health and the Environment.

If you have any questions or require additional information, please contact Rick Roberts at extension 8508.

*Emash  
For*

R. Bray	X	X
J. Laurin	X	X
S. Roberts	X	X
R. Volk	X	X
CORRES. CONTROL	X	X
ADMIN RECORD/080	X	X
TRAFFIC		
ATS/T130G		

W. S. Busby  
Manager  
Operable Unit 2 Closure

JRB:bll

cc:  
Orig. and 1 cc - S. R. Grace

CLASSIFICATION:

UNCLASSIFIED		
CONFIDENTIAL		
SECRET		

Attachments:  
As Stated (2)

cc:  
E. A. Dille - Aguirre Engineering

AUTHORIZED CLASSIFIER  
SIGNATURE  
DOCUMENT CLASSIFICATION  
REVIEW WAIVER PER  
CLASSIFICATION OFFICE  
DATE

REPLY TO RFP CC NO:

STATION ITEM STATUS  
PARTIAL/OPEN  
CLOSED

APPROVALS:

SIG & TYPIST INITIALS

JRB bll

ADMIN RECORD

BZ-A-00133

**Responses to Comments  
from CDPHE and EPA**

**on**

**Technical Memorandum No. 9  
Chemicals of Concern (Draft Final)  
August 1994**

**for**

**Operable Unit No. 2  
903 Pad, Mound, and East Trenches Areas  
Rocky Flats Environmental Technology Site**

This document presents DOE's responses to comments received from the Colorado Department of Public Health and Environment (CDPHE) and EPA Region VIII (EPA) on the above-named Technical Memorandum No. 9 (TM 9), Chemicals of Concern for Operable Unit No. 2 at Rocky Flats Environmental Technology Site. CDPHE stated its approval of TM 9 in its comment letter of September 29, 1994, but asked for response to comments that requested explanation or additional information. EPA submitted one comment on September 28, 1994.

**CDPHE COMMENTS**

Note: Agency comments are paraphrased.

Page 3-3.     Comment: CDPHE notes that evaluating risk from exposure to soil containing PAHs in the uncertainty section of the human health risk assessment (HHRA), as proposed in TM 9, is probably sufficient.

Response: None required.

Page 3-4.     Comment: CDPHE notes that comparison of PAH data to background data might have been appropriate.

Response: None required.

Table 3-4.     Comment: Are there any speciation data on chromium in OU2 surface soil? TM 9 assumes chromium is in the less toxic +3 form, whereas historic activities include use of the more toxic Cr+6. While most chromium in soil is converted with time to the trivalent form, it would still be prudent for DOE to find out whether any of the detected chromium in surface soil is still in the more dangerous hexavalent form.

Response: Speciation data are available. Twelve surface soil samples in OU2 were analyzed for total chromium and for Cr+6. Six analyses for Cr+6 were useable; the other six were R-qualified (rejected) because of exceedance of holding times. Cr+6 was nondetect in all samples. The SQL was approximately 1 mg/kg (CRDL was 2 or 10 mg/kg). Total chromium was detected in these samples in concentrations ranging from 9 to 16 mg/kg. Of the samples with useable Cr+6 results, one was collected in the Northeast Trenches area south of the B-series ponds, one was collected in IHSS 216.2 (East Spray Field) where chromium-contaminated wastewater is thought to have been sprayed, and four were collected in non-IHSS areas in the buffer zone. These data indicate that Cr+6 does not occur in elevated concentrations in OU2 surface soils, even where chromium-bearing wastewater may have been disposed.

In addition, the SQL of 1 mg/kg can be compared to a risk-based concentration (RBC) for residential exposure to Cr+6 in soil. The RBC is 9.62E+02 mg/kg (DOE 1994a). Because both total Cr and Cr+6 results are well below this screening value, we do not believe that further evaluation of Cr+6 in risk assessment is warranted.

Furthermore, chromium was found to be within background levels according to the formal statistical tests. The fact that no statistical difference from background was identified indicates that chromium is probably naturally occurring in surface soils. Only two sample results exceeded the background UTL<sub>99/99</sub> of 24.8 mg/kg: 28 mg/kg detected at SS200193 in the 903 Pad area and 29.5 mg/kg at SS200893 in a non-IHSS area approximately 700 feet south of the Southeast Trenches. These exceedances of the background UTL are minor; nevertheless, they resulted in chromium being retained as a PCOC in surface soil. Chromium was then identified as a COC

on the basis of a concentration/toxicity screen for noncarcinogens that included only chromium +3 and bis(2-ethylhexyl)phthalate. On the basis of the available data, we believe that even including chromium +3 as a COC in surface soil is extremely conservative.

Page 4-2. Comment: CDPHE agrees that the rationale for eliminating barium from consideration at the SE Trenches area is convincing. However, CDPHE questions eliminating barium from consideration at Trench T-12 because IHSS boundaries are not precise, the detection of 469 mg/kg was at a depth of 10 to 15 feet below ground surface, which could be a result of leaching from the trench, and DOE has not proven that barium is not waste-related.

Response: We do not dispute the use of sample results from borehole 46792 (completed as a monitoring well) for characterizing potential releases from Trench T-12. However, we believe that the weight of evidence for eliminating barium from consideration at this site is as convincing as the evidence supporting its elimination at other sites. As discussed on page 4-2 of TM 9, barium in OU2 subsurface soil samples was not statistically different than background levels. Only four barium results (out of over 300) exceeded the background UTL<sub>99/99</sub> of 371 mg/kg, which would be predicted in a sample size of this magnitude. In other words, the variability appears normal. In addition, no OU2 result exceeded the background maximum of 777 mg/kg. This evidence indicates that barium is not a contaminant in OU2 subsurface soils.

Trench T-12 is believed to contain sewage sludge. Regarding the evidence for contamination at location 46792, in the 0- to 5-foot interval, calcium ( $1.1\text{E}+05$  mg/kg), americium (4.85 pCi/g), plutonium 31.4 pCi/g), uranium-235 (0.15 pCi/g), and cesium-137 (0.34 pCi/g) were detected at levels above background screening levels (BSLs) (background mean plus two standard deviations). No PCOCs were detected above BSLs in the 5- to 10-foot interval. In the 10- to 15-foot interval, the only PCOCs detected above BSLs were arsenic (14.9 mg/kg), barium (469 mg/kg), and manganese (3160 mg/kg). Manganese was also excluded from further evaluation as an OU-wide COC (TM 9, page 4-3) even though this single result of 3160 mg/kg exceeded the background UTL<sub>99/99</sub> of 1194 mg/kg. The logic for its exclusion is comparable to the logic used for the exclusion of barium. The barium concentration in this sample should not be reason to consider barium as an OU-wide PCOC or COC. Arsenic was retained as a PCOC (and COC) based on numerous sample results, in spite of uncertainty regarding its identification as a contaminant, for the reasons discussed on page 4-4 of TM 9.

In conclusion, DOE does not consider barium a contaminant in subsurface soil in OU2.

Table 4-5.     Comment: Figure 4-4i shows tritium was detected in subsurface soil at IHSSs, but tritium is not discussed in the text nor shown in any of the tables.

Response: Tritium was inadvertently omitted from Section 4.0 (Subsurface Soil). Tritium is not a chemical of concern in subsurface soil, as demonstrated in the following analysis. The maximum reported tritium activity in subsurface soil was 36,500 pCi/L (mean activity = 243 pCi/L; std dev = 2267 pCi/L). The maximum activity in units of pCi/L can be converted to units of pCi/g soil using the average soil moisture content (13.5 percent, calculated from 40 soil samples collected in OU2 alluvium and Arapahoe formation), as follows:

$$\frac{36,500 \text{ pCi}}{1 \text{ L H}_2\text{O}} \times \frac{13.5 \text{ g H}_2\text{O}}{100 \text{ g soil}} \times \frac{1 \text{ L}}{1000 \text{ g H}_2\text{O}} = 4.9 \text{ pCi/g soil}$$

If this maximum activity were included in the concentration/toxicity screen (Table 4-5 in TM 9), the activity would be multiplied by the higher of the inhalation (7.8E-14) and oral (5.4E-14) slope factors, resulting in a risk factor, from which a risk index and % of total risk factor is calculated. These calculations are shown below:

$$4.9 \text{ pCi/g} \times 7.8\text{E-}14 = 3.8\text{E-}13 \text{ (risk factor)}$$

$$\frac{3.8\text{E-}13 \text{ (risk factor)}}{1.6\text{E-}05 \text{ (total risk factor from Table 4-5)}} = 0 \text{ percent of total risk factor}$$

Tritium is not a chemical of concern in subsurface soil on the basis of this concentration/toxicity screening. (It is also interesting to note that tritium in OU2 groundwater was not significantly different than background.)

Page 4-5.     Comment: Table 4-7 is missing.

Response: Table 4-7 was inadvertently omitted. It was submitted with corrections to DOE on September 29, 1994, for transmittal to CDPHE. The table with corrections is also attached to this responsiveness summary.

Page 4-6.     Comment: CDPHE notes discrepancies in references to Table B-4 and B-5 and in the number of compounds without EPA toxicity factors.

Response: The reference to Table B-4 on page 4-6 is incorrect. The correct reference is Table B-5. Eight PCOCs in subsurface soil do not have EPA toxicity factors. These are listed on the attached Table 4-7. This clarification was also provided DOE for transmittal to CDPHE on September 29, 1994.

Page 5-2.     Comment: CDPHE acknowledges that there are good indications that high concentrations of the metals aluminum, antimony, beryllium, manganese, and vanadium in unfiltered samples are associated with high total suspended solids (TSS) and that the argument appears to be valid. However, EPA guidance for risk assessment recommends using unfiltered results because most domestic wells do not have filters and people might be exposed to unfiltered sediment in their drinking water. CDPHE therefore suggests calculating risk using both unfiltered and filtered concentrations. CDPHE also notes that while it was shown that manganese in groundwater is probably not related to the presence of VOC contamination, the possibility of leaching of Al, Be, and V into groundwater by solvents has not been ruled out.

Response: DOE believes that the evidence regarding association of high unfiltered metals concentrations with high TSS supports a conclusion that elevated metals in groundwater are not related to contamination in OU2. Regarding calculating risk from exposure to suspended sediment in water, although EPA policy may require assessment of risk using unfiltered metal results, it is not reasonable to assume long-term residential use of unfiltered water containing high TSS and that is visibly cloudy or discolored, nor is it reasonable to calculate risk from ingesting naturally occurring metals whose concentrations in unfiltered samples can be demonstrated to be unrelated to contamination. However, in response to CDPHE and EPA concerns, DOE will calculate risk from groundwater ingestion for selected metals (antimony, arsenic, beryllium, and manganese) identified by EPA in its comment on TM 9 and present the results in the uncertainty section of the baseline risk assessment. The risk results for ingestion of these four metals in groundwater will not be added to total risk. These metals are probably naturally occurring, but, as noted in EPA's comment, their maximum concentrations are well above conservative risk-based screening levels.

Regarding aluminum and vanadium, CDPHE comments that the possibility of leaching into

groundwater by solvents has not been ruled out. If this were occurring, concentrations in the filtered fraction would be elevated because leachate can mobilize naturally occurring metals into aqueous phase. However, aluminum and vanadium in filtered samples were within background levels (see Appendix A, TM 9). Therefore, the presence of high concentrations of aluminum and vanadium in unfiltered samples is not the result of groundwater contamination. DOE does not propose to include aluminum and vanadium in risk calculations for OU2 groundwater.

Page 5-7.     Comment: CDPHE questions the accuracy and completeness of the data used to define 1,1,2,2-PCA and cis-1,3-dichloropropene in groundwater as low-frequency compounds with temporally isolated occurrences of high concentrations. Elevated reporting limits may prevent an accurate estimate of detection frequency, and temporal isolation of high concentrations could result from contaminants located not far from the water table in a position to act as a continuing, if sporadic, source, in which case they should not be eliminated from the risk assessment.

Response: DOE has re-evaluated the analytical results for these compounds in groundwater and in subsurface soil at the locations of maximum groundwater concentrations and has come to the following conclusions:

(1) In subsurface soil, the maximum concentrations of cis-1,3-dichloropropene and 1,1,2,2-PCA were 6 ppb (at BH2887 in the 903 Lip area) and 5 ppb (at boring 08291 in the Southeast Trenches area), respectively. Overall detection frequency in soil was < 1% for each compound. The maximums were detected in groundwater (1600 ppb cis-1,3-dichloropropene and 180 ppb 1,1,2,2-PCA) were both found at well 7391 near Trench T-2 in the 903 Pad area. These compounds were not detected in subsurface soil samples collected in numerous borings at Trench T-2, including boring 7391, which was completed as a monitoring well. These results do not indicate that subsurface soil is a significant source of these contaminants.

(2) It is true that elevated reporting limits can make the calculation of detection frequency and assessment of temporal transience uncertain; however, review of the data indicates that these compounds are not likely to be present in most samples where they were reported non-detect. Using the data shown on Table B-4 as a basis for evaluation, reporting limits in samples collected from wells where the compounds were detected at least once ranged from 0.01 ppb to 1500 ppb; however, 80 percent of the samples (19/24) had reporting limits of 0.01 to 0.5 ppb, and only 3 of the 24 samples (12 percent) had reporting limits above 10 ppb. Most detected

concentrations ranged from 0.3 to 2 ppb, and reporting limits from 0.01 to 0.5 ppb are low enough to detect the lowest reported concentrations of these compounds. Nevertheless, there are a few samples with extremely elevated reporting limits where only a qualitative assessment of the probable presence or absence of the compounds can be made, based on sampling history (see (4) below).

(3) In Table B-4, all reporting limits for samples analyzed for cis-1,3-dichloropropene and 1,1,2,2-PCA, except one reporting limit of 1500 ppb for 1,1,2,2-PCA, are below the screening criteria of 1000 x RBCs for residential use of groundwater (127 ppb for cis-1,3-dichloropropene and 90 ppb for 1,1,2,2-PCA; DOE 1994a). Therefore, even if the compounds were present in concentrations equivalent to reporting limits, with one exception, the concentrations would not exceed the 1000 x RBC screening level.

(4) The rationale for eliminating the compounds from further evaluation is based on temporal transience of the elevated concentrations. The low reporting limits for most samples in which the compounds were non-detect support a conclusion that high concentrations of these compounds are isolated occurrences. The temporal variability of detections of 1,1,2,2-PCA in well 7391, where the maximum concentration of 180 ppb was detected, was further evaluated by reviewing results of subsequent sampling rounds at this well. 1,1,2,2-PCA was non-detect in all six subsequent samples for which results are available. Reporting limits for the six samples were variable: 400, 1500, 5, 10, 2500, and 2500 ppb. Elevated reporting limits occur because of sample dilution to detect even higher concentrations of other VOCs present in the sample. While the elevated reporting limits introduce uncertainty, we believe sufficient evidence is present to conclude that high concentrations of 1,1,2,2-PCA (i.e., concentrations above 1000 x RBCs) are temporally isolated occurrences.

(5) The elimination of these two compounds from further evaluation in risk assessment will not alter the results or conclusions of the risk assessment or remediation decisions for OU2. Groundwater in OU2 is contaminated with chlorinated solvents detected in up to 68 percent of samples, in concentrations up to 150,000 ppb (trichloroethene). Some of the highest concentrations occur at the 903 Pad area, where the cis-1,2-dichloropropene and 1,1,2,2-PCA were detected. Remediation of the chief chlorinated solvents in groundwater will result in clean up of other chlorinated solvents as well.



In conclusion, we do not propose to include cis-1,3-dichloropropene or 1,1,2,2-PCA as special case COCs in groundwater, because the evidence indicates they are detected at low frequency, high concentrations appear to be temporally isolated, and overall risk estimates and remediation decisions will not be affected.

**Table 5-3.** Comment: Footnote 1 regarding nitrate refers to a discussion in text, but there is none.

Response: The footnote is incorrect; there is no text discussion of nitrate. The maximum detected concentration was used in the concentration/toxicity screen to select COCs.

Appendix B. Comment: RBCs were not calculated using child exposure factors, other than soil ingestion, and the construction worker exposure was used to screen subsurface soils, rather than residential exposure as requested by the State. While no difference in the final list of COCs probably occurred due to this discrepancy, residential exposure parameters should be used later on while defining Areas of Concern.

Response: Contaminant source areas and areas of concern are defined by concentrations exceeding background screening levels. Residential exposure parameters were used to perform the CDPHE conservative risk-based screen for source areas (DOE 1994b).

#### **EPA Comment September 28, 1994**

Comment: (Paraphrased) The argument excluding certain metals from the toxicity/concentration screen for groundwater is good, but since the maximum concentrations of antimony, beryllium, manganese, and arsenic are well above PRGs (RFCs), it would be smart to include these as COCs in groundwater, even though the PRGs are conservative.

Response: TM 9 presents evidence that these metals are related to suspended

sediment in groundwater samples and are not due to groundwater contamination. Nevertheless, to respond to agency concerns, DOE will calculate risk from groundwater ingestion for these metals and present the results in the uncertainty section of the baseline risk assessment. The risk results will not be added to total risk.

## REFERENCES

DOE. 1994a. Programmatic Risk-Based Preliminary Remediation Goals. Final. Revision 1. October 1994.

DOE. 1994b. Letter Report. Colorado Department of Public Health and Environment Source Area Delineation and Risk-Based Conservative Screen and Environmental Protection Agency Areas of Concern Delineation. Human Health Risk Assessment, Operable Unit No. 2. Rocky Flats Environmental Technology Site. September 27.